

# OPERATING & SERVICE

# MANUAL

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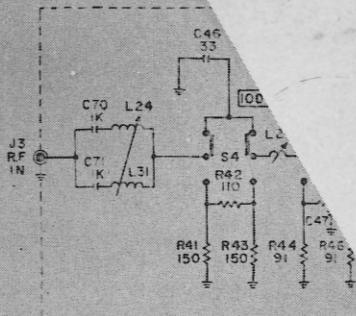
## D.C. AMPLIFIER

## DETECTOR

PCB 2

# FCM-7

## UHF/VHF FIELD STRENGTH METER



**OPERATION AND SERVICE MANUAL**

**FSM - 2**

**UHF/VHF FIELD STRENGTH**

**METER**

This manual is intended for use in operating and maintaining the B-T FSM-2. Any other use or unauthorized reproduction without written permission from Blonder-Tongue Laboratories is prohibited.

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## SECTION 1

### GENERAL INFORMATION

#### 1.1 INTRODUCTION

This instruction manual contains installation, operation, and service information for the Blonder-Tongue Model FSM-2 Field Strength Meter.

#### 1.2 DESCRIPTION

The FSM-2 is an all solid state, portable, UHF/VHF Field Strength Meter. It may be used in all general applications to identify and determine the field strengths of VHF/FM and UHF transmissions. Both average and peak output readings are available. The unit has a maximum full scale sensitivity of 100 $\mu$ v and an accuracy of  $\pm 1.5$ db across its entire range. The FSM-2 may be powered either from an external 105-130, 40-400 Hz source or by internally contained batteries. Signal input to the unit is made through a Type F connector (supplied). A test jack is provided to monitor the detected r-f output.

#### 1.3 SPECIFICATIONS

|                                  |                                                                                                      |
|----------------------------------|------------------------------------------------------------------------------------------------------|
| Frequency Range:                 | VHF: 54-216 Mhz continuous<br>UHF: 470-890 MHz continuous                                            |
| Full-Scale<br>Sensitivity Range: | 100 $\mu$ v to 3 volts                                                                               |
| Input Impedance:                 | 75 ohms (300-75 ohm U/V balun provided)                                                              |
| Monitor Output:                  | AC: 2V p-p at 500 ohms<br>DC: 50 $\mu$ a minimum for recorder                                        |
| VSWR:                            | up to 100 $\mu$ v input: 2.0<br>over 100 $\mu$ v input: 1.22                                         |
| Selectivity:                     | -3db points: $\pm 0.25$ mc from center frequency<br>-60db points: $\pm 0.9$ mc from center frequency |
| Accuracy:                        | $\pm 1.5$ db                                                                                         |
| Temperature Range:               | -20 to 120° F (-29 to 49° C)                                                                         |

Power Requirements: Line: 105-130 VAC, 50-400 cps, 3W  
 Batteries: (2) NEDA 1603, Eveready 276, Burgess D6, RCA VS306, or equivalent. Each pair yields approx. 180 hrs. of intermittent (2 hr. periods) use

Connectors: Type F (input), Phone Jack (monitor out.)

Size (cover closed): 12 5/8" W x 7 3/4" H x 7" D

Weight: 13 lbs. with batteries (not supplied)

#### 1.4 ACCESSORIES AND LITERATURE SUPPLIED

The following accessories and literature are supplied with the FSM-2:

| Quantity | Name                       | B-T Part Designation |
|----------|----------------------------|----------------------|
| 1        | Balun                      | MT-283               |
| 2        | Connector*                 | BTF-591              |
| 1        | Connector*                 | BTF-59P              |
| 1        | Instruction Manual         | FSM-2 (6510692)      |
| 1        | Simplified Oper. Procedure | FSM-2 (6510658)      |

\*associated literature also supplied.

#### 1.5 ASSOCIATED ACCESSORIES

A low-frequency converter, a handle kit, and a handle and cover accessory kit are available to simplify use of the FSM-2. These accessories may be obtained from your dealer or directly from Blonder-Tongue. In addition, the FSM-2 is designed to permit attachment of a carrying strap.

##### CONVERTER (MODEL 4132)

The Model 4132 is an r-f signal converter for use in the 5-54 MHz band. When the 4132 is used with the FSM-2 Field Strength Meter, signal strength measurements of television sub-channels and other frequencies in the 5-54 MHz band can be readily made. The output frequency of the converter is always 100 MHz above the incoming frequency. Therefore, with signals in the 5-54 MHz range, the output will fall between 105 and 154 MHz. This range is above the FM band and below the VHF TV high band.

The converter is designed for mounting on top of the FSM-2 Field Strength Meter. It is secured in place with two screws supplied with the FSM-2.

Electrically the converter contains a 100 MHz oscillator, mixer, and appropriate filters. The converted 5 MHz to 54 MHz frequency spectrum is displayed from 105 to 154 MHz on the FSM-2 frequency dial. The FSM-2 dial has this frequency range marked accordingly. The unit is powered by a self-contained battery. Operating instructions and mounting procedures are supplied with the converter.

##### FSM HANDLE KIT (MODEL 4134)

The Model 4134 consists of a handle and two mounting screws. The handle, which may be readily attached, provides a simple way to carry the FSM-2. Two spring-loaded brackets in the handle permit temporary attachment of the unit to a messenger cable.

##### FSM HANDLE AND COVER ACCESSORY KIT (MODEL 4131)

The Model 4131 consists of a FSM handle kit as previously described, and a snap-on cover. The cover is made of black rubber-impregnated nylon cloth with an adjustable, transparent plastic window. The plastic window, while protecting the unit from rain, permits observation and use of the FSM-2 operating controls.

##### CARRYING STRAP

If a carrying strap is desired, one may be readily made or bought. The strap may be assembled from a 4 1/2-foot-long, 1-to-2-inch-wide piece of leather or webbing, and two 5/16-inch (I.D.) eyelets, as shown in Figure 1. Place eyelets at least 1-inch from the strap end.

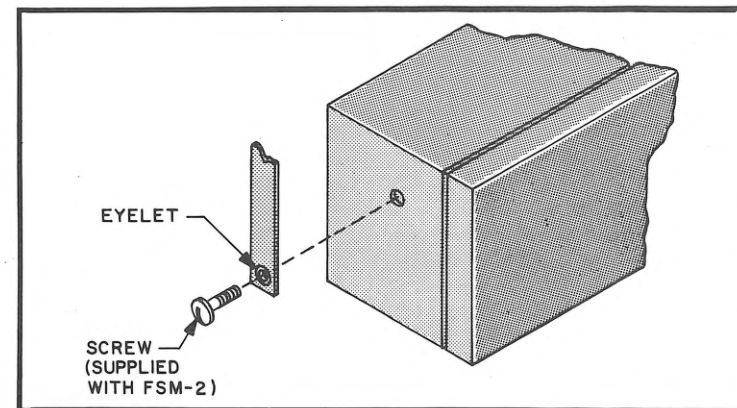


Figure 1. Carrying Strap Detail



Remove the truss-head screws from both ends of the FSM-2 case, slip the screws through the eyelets, and re-fasten them to the case as shown.

If you do not wish to make the strap, you may buy a similar one, making sure it has eyelets and will readily support the unit. Straps with larger eyelets may be used, provided a washer is used to prevent the screw-head from slipping through the eyelet.

## 1.6 FACTORY CALIBRATION

The accuracy of the FSM-2 is  $\pm 1.5$  db over the frequency ranges of 54-216 MHz and 470-890 MHz. A blank calibration chart for checking and recording accuracy at specific points in the frequency ranges is printed in the appendix. If calibration facilities are available, this chart should be completed by the customer and kept with the FSM-2.

However, if calibration facilities are not available and accuracy better than the standard specifications is required, a factory calibrated Model (FSM-2C) is available on special order.

If factory calibration of your FSM-2 is desired, pack the unit carefully, enclose a letter of explanation, and mail the unit prepaid to:

Service Department  
Blonder-Tongue Laboratories, Inc.  
9 Alling Street, Newark, New Jersey 07102

The charge for factory calibration is \$35.00 per meter (price subject to change without notice).

## 1.7 MISCELLANEOUS DATA

For your convenience, information on U.S. television channel allocations and a dBmV microvolt conversion chart are supplied in the appendix.

## SECTION 2 INSTALLATION

### 2.1 POWER CONNECTIONS

The FSM-2 may be either battery powered or connected to a 105-130V, 50-400 Hz power source.

#### BATTERY INSTALLATION (see Figure 2)

If battery powering is desired, install batteries as follows.

1. Using a screwdriver or small coin, rotate fastener on rear door 1/4-turn counterclockwise.

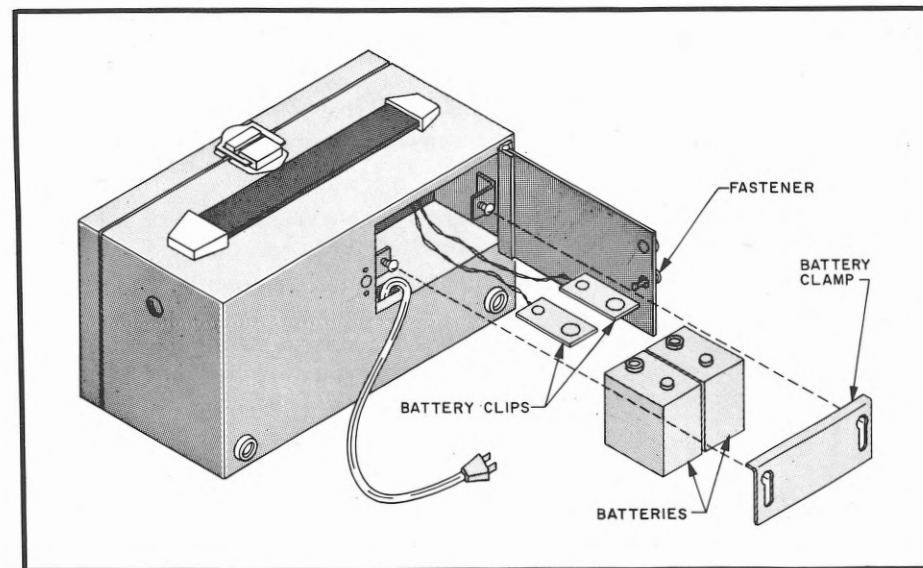


Figure 2. Battery Installation

2. Swing door open to expose battery compartment. Loosen two screws which hold battery clamp in place. Move battery clamp downwards so that larger part of "key-hole" openings are around screws. Remove battery clamp from case.

3. Attach a 9-volt battery to each of the two battery clips. (Batteries are not supplied with the unit - see specifications for recommended types.) Wrap batteries in thin plastic bags or sheet material to protect the FSM should the batteries leak. The material used by dry cleaning establishments works well for this purpose.
4. Place batteries in battery compartment and secure them with the battery clamp.
5. Close rear door, and rotate fastener 1/4-turn clockwise.

#### Caution

To prevent the possibility of damage due to battery leakage, remove the batteries from unit whenever it will not be operated for an extended period of time. Inspect batteries frequently, when the unit is used in unusually hot or moist climates.

### LINE POWER CONNECTION

The line cord is coiled and stored within the battery compartment. To operate the unit using line power, route the cord through the slot in the compartment door and then plug it into any 115-volt 50-400 Hz source. It is not necessary to disconnect the batteries or make any other internal connections when switching between AC and battery power.

### 2.2 USE OF MT-283 MATCHING TRANSFORMER

When monitoring a 300-ohm signal source, connect the MT-283 balun (supplied) between the source and the FSM-2 input. When the balun is used, multiply the FSM-2 voltage reading by 2.2 to compensate for the transformation ratio and losses. Figure 3 shows connections between the balun and the FSM-2.

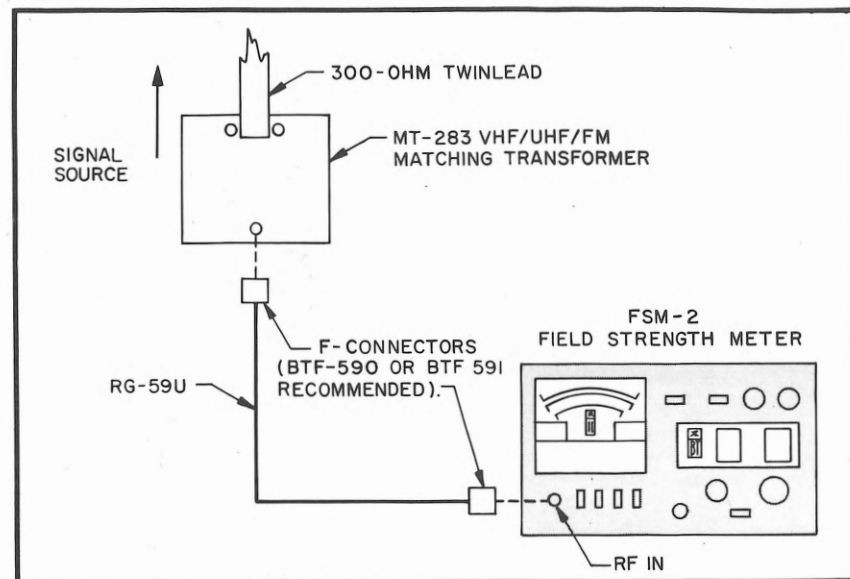


Figure 3. Connection of Balun to FSM-2

### 2.3 COVER REMOVAL

The front may be removed by loosening and rotating the hinge fastener, as shown in Figure 4. The cover may then be moved to the side and slipped off, as shown.

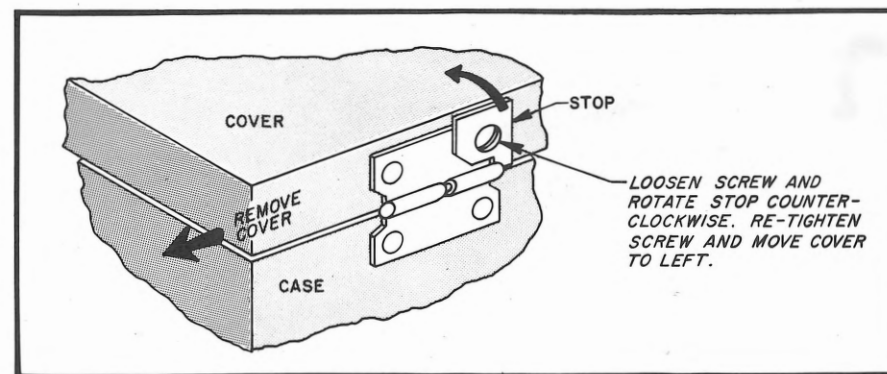


Figure 4. Cover Removal Procedure

## SECTION 3

### OPERATION

#### 3.1 PREPARATION FOR USE

1. Set OFF-BAT-AC switch OFF.
2. Either install batteries or plug unit into a 105-130, 50-400 Hz voltage source.
3. Check meter mechanical zero. Dial pointer should be at MECHANICAL ZERO line. If necessary, turn screwdriver adjustment on dial face.

#### Note

Different setting of the meter mechanical zero control may be required to mechanically zero the meter for different positions of the FSM-2. (e.g., when front panel is vertical, horizontal, etc.)

4. Set OFF-BAT-AC switch to either BAT or AC depending on type of power used. Set VOLT-AVG-PEAK switch to VOLT.
5. Adjust VOLT SET control until meter pointer is at VOLT SET line.
6. Set VOLT-AVG-PEAK switch to either AVG or PEAK. Because of the pulsed nature of video transmissions, peak readings are used almost exclusively with television signals. Adjust ZERO SET control until meter pointer is at ELECTRICAL ZERO LINE. Check this adjustment when operating mode is changed between AVG and PEAK.
7. Set VHF-UHF switch to desired band.
8. Connect input signal to RF IN jack.

#### 3.2 OPERATING CONTROLS

All operating controls for the FSM-2 are located on the front panel of the unit (Figure 5). Table 1 lists and describes functions of these controls.

| CONTROL                         | FUNCTION                                                                                                                                                                                                                                  |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OFF-BAT-AC                      | On-off and power selector switch.                                                                                                                                                                                                         |
| VOLT-AVG-PEAK                   | VOLT position - monitors internal operating voltage.<br>AVG position - meter shows average value of RF IN signal. Detected r-f signal is internally connected to MOD OUT jack.<br>PEAK position - meter shows peak value of RF IN signal. |
| ZERO SET                        | Electrical zero set.                                                                                                                                                                                                                      |
| VOLT SET                        | Adjusts internal operating voltage.                                                                                                                                                                                                       |
| IF ATTEN                        | Variable 20dB attenuator. Controls meter sensitivity.                                                                                                                                                                                     |
| VHF-UHF                         | Selects operating band.                                                                                                                                                                                                                   |
| TUNING                          | Selects operating frequency of FSM-2                                                                                                                                                                                                      |
| RF ATTENUATORS (10dB, 20dB (3)) | Control attenuation of RF IN signal. Values from 10 to 70dB (in 10dB steps) are available.                                                                                                                                                |
| Mechanical Zero (on meter face) | Mechanically zeros meter movement.                                                                                                                                                                                                        |

Table 1. Operating Control Functions

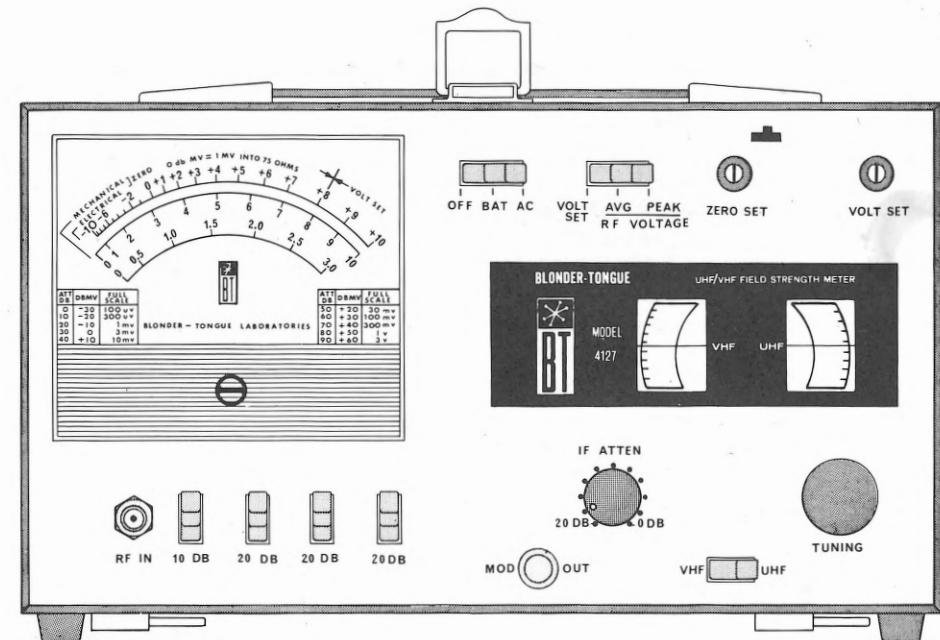


Figure 5. FSM-2 Front Panel View

## SECTION 4

### APPLICATIONS

#### 4.1 MEASURING SIGNALS

This procedure assumes that the initial set-up procedure has already been performed.

1. Switch the VHF-UHF selector to the desired band.
2. Move the VOLT AVG-PEAK switch to either AVG or PEAK, depending upon the mode of measurement desired.

#### Note

In the AVG mode, the detected signal is available at the MOD OUT jack. In the PEAK mode, only the DC component of the signal is available at the jack. Video will be heard (through a pair of high-impedance headphones) as a buzz. Detuning the FSM slightly from the audio carrier will permit identification of the audio.

#### 3. For monitoring strong signals

- a. Move all RF ATTENUATORS to IN (lower) position.
- b. Move OFF-BAT-AC switch to either BAT or AC, as desired.
- c. Tune dial to location of signal to be measured.
- d. Remove attenuation from circuit in the following order until meter pointer is between 0 and +10 on the meter db scale.

20db RF ATTENUATORS  
20db IF ATTEN control  
10db RF ATTENUATOR

#### 4. For monitoring weak signals

- a. Place 10db RF ATTENUATOR IN and IF ATTEN control to 20dB.
- b. Move OFF-BAT-AC switch to either BAT or AC as desired.
- c. Tune dial to location of signal to be measured.
- d. If signal is too weak to move meter pointer set IF ATTEN control to 0 and 10db RF ATTENUATOR OUT (in that order) until pointer is between 0 and +10 on the meter db scale.

#### 4.2 VOLTAGE AND DBM V

The field strength meter may be read either volts (i.e., volts, millivolts or microvolts, depending upon level), or dBmV. Signals present at antenna terminals, preamplifier and amplifier sensitivity, and overload levels are often expressed in microvolts. Amplifier gain, system losses, and isolation are expressed in db. The unit dBmV makes the two systems of reference compatible.

Db is a ratio of two levels. Expressed in db, the ratio of voltages

$$E_1 \text{ and } E_2 \text{ is } 20 \text{ LOG}_{10} \frac{E_1}{E_2}$$

To make readings in volts compatible with db-readings, we establish a reference level, called "zero dBmV", which is 1,000 microvolts (1 mv) applied across a 75-ohm load. This value is the minimum desirable level for driving a television set in an MATV or CATV system. By adopting this level, we can refer to all signal values in a circuit or system as a dBmV value, (i.e., as a kind of multiple or fraction of our zero-dBmV value). For example, with a 20db gain amplifier a 10,000 microvolt (20dBmV) signal input will produce 40dBmV (100,000  $\mu$ v) output. Use of the dBmV in this manner greatly simplifies system layout and design.

#### Note

A dBmV-microvolt equivalent chart is provided in the appendix of this manual.

### 4.3 VOLTAGE READINGS

1. Using procedure outlined under MEASURING SIGNALS, add values of IN attenuator switches and attenuation value from IF ATTEN control.
2. Using chart printed on lower half of meter face, note full scale sensitivity corresponding to the IN attenuation (step 1). For example if IN attenuation is 30db, full scale meter reading (0-3 scale) will be 3mv.

#### Note

Setting of IF ATTEN control counts as IN attenuation.

3. Use the following formula to compute signal strength.

$$\text{Meter Reading} \times \frac{\text{full scale sensitivity}}{\text{scale factor (3 or 10)}} = \text{signal strength}$$

#### Examples

|                                                          |   |                                                            |
|----------------------------------------------------------|---|------------------------------------------------------------|
| Meter reads 2.8                                          | : | Meter reads 5.5                                            |
| IF ATTEN at 20                                           | : | IF ATTEN at 20                                             |
| 10db of attenuation IN                                   | : | 40db of attenuation IN                                     |
| $2.8 \times \frac{3\text{mv}}{3} = \boxed{2.8\text{mv}}$ | : | $5.5 \times \frac{100\text{mv}}{10} = \boxed{55\text{mv}}$ |

### 4.4 DBMV READINGS

With the IF ATTEN control at 20db and the 10db attenuator switch (red) in, the meter reads directly in dBmV (0dBmV = 1mv across 75 ohms). Calculate dBmV levels as follows:

1. Perform the procedure outlined under MEASURING SIGNALS.
2. Add values of IN attenuator switches. For simplified calculations, always use the 10db attenuator switch first.

3. If IN attenuation is less than 30db, subtract difference between IN attenuation and 30db from meter reading.

#### Example

Meter reads +6  
IN attenuation is 20db  
 $20\text{db} - 30\text{db} = -10\text{db}$   
 $+6 - 10 = \boxed{-4\text{dbmv}}$

4. If IN attenuation is more than 30db, add difference between IN attenuation and 30db to meter reading.

#### Example

Meter reads +6  
IN attenuation is 50db  
 $50\text{db} - 30\text{db} = 20\text{db}$   
 $+6 + 20 = \boxed{+26\text{dbmv}}$

### 4.5 COMPARING SIGNALS

This procedure is useful for measuring system losses, setting amplifier gain, etc. Proceed as follows:

1. Feed reference signal into FSM-2. Adjust IF ATTEN and RF ATTENUATORS until meter reads zero on dBmV scale.
2. Compute signal strength as outlined under dBmV READINGS.
3. Disconnect reference signal and feed second signal into FSM-2. Add or subtract attenuation until meter again reads zero.
4. Difference between attenuation used in steps 1 and 3 is the signal difference in dBmV.



#### 4.6 MEASURING MODULATION

Measure the percentage of sine wave modulation of a signal as follows:

##### Note

As with all but true RMS-reading meters, the readings obtained using this method are only valid with sine-wave signals.

1. Set the VOLT AVG-PEAK switch to PEAK. Adjust the meter for a +10db reading by beginning with all RF ATTENUATORS IN, and with the IF ATTEN control set to 20db.
2. Remove the RF ATTENUATORS, one by one, until a meter reading somewhere between 0 and +10db is produced. Rotate IF ATTEN control clockwise until the meter reads +10db.
3. Move the VOLT AVG-PEAK switch to AVG. The percentage of modulation may be found from the chart in Figure 6, by noting the modulation percentage corresponding to the new meter reading.

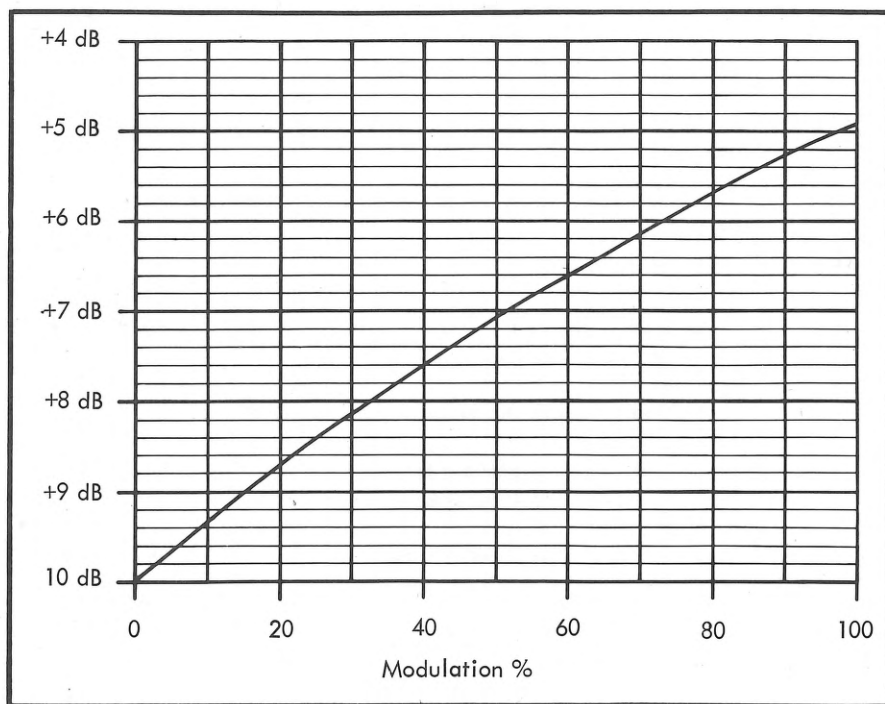


Figure 6. Modulation Chart

#### 4.7 FIELD STRENGTH MEASUREMENTS

Field strength measurements may be made by fabricating one of the standard dipoles shown in Figure 7 or 8. Compute dipole length (L) from the following formula:

$$L \text{ (in inches)} = \frac{5540}{\text{freq. in mc}} \quad (\text{see appendix for table of channel carrier frequencies})$$

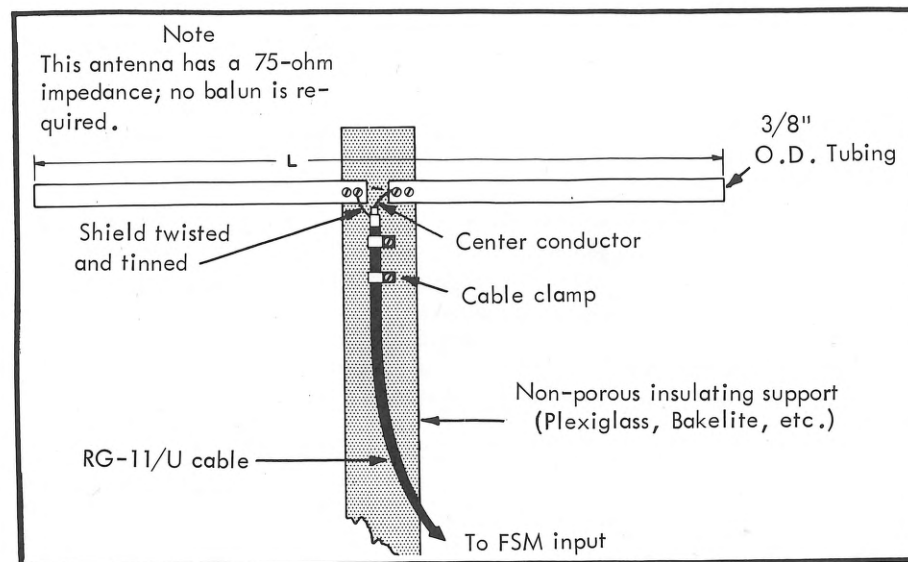


Figure 7. Fabrication Diagram Straight Dipole

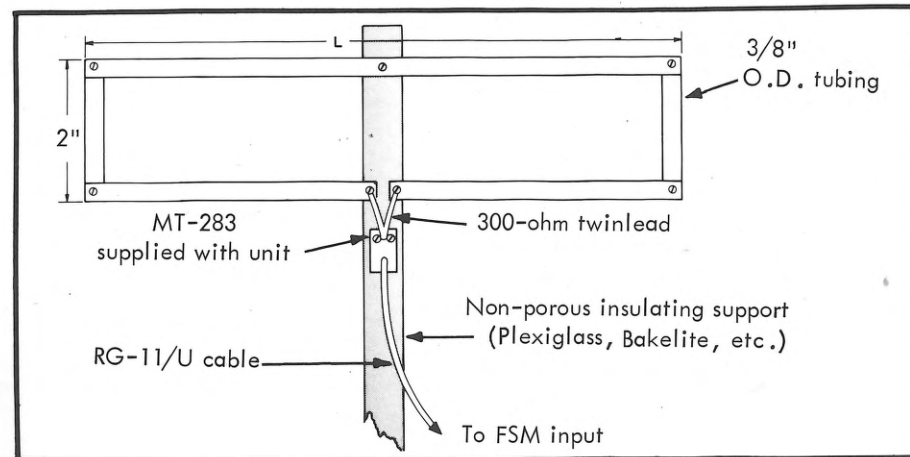


Figure 8. Fabrication Diagram Folded Dipole

Compute field strength in microvolts per meter ( $\mu\text{V}/\text{M}$ ) from the following formula:

$$\mu\text{V}/\text{M} = \frac{\text{freq. in mc}}{47.6} \times \text{meter reading in } \mu\text{V} \times \text{correction factor}$$

The correction factor is 1.2 for the folded dipole, and eliminates the need for incorporating balun and cable losses (for short lengths of cable) in the measurement. The correction factor for the straight dipole is 1.1.

If an antenna other than the ones shown above is used, the figure above should be divided by the gain of the other antenna relative to the dipole.

## SECTION 5

### THEORY OF OPERATION

The FSM-2 is completely transistorized; silicon transistors are used in all circuits except for the power supply. The power supply uses a germanium transistor which prolongs battery life because of its low internal voltage drop. A schematic diagram of the unit is furnished separately with this manual. A simplified block diagram is shown in Figure 9.

The UHF/VHF signal input is fed through RF IN jack J3 to a four-section attenuator consisting of three 20dB sections and one 10dB section. Each section is controlled by a slide switch. The attenuator output is connected via J4 and a short section of coaxial cable to connector J1. VHF signals present at J1 are fed through a low-pass filter to the VHF headend consisting of oscillator transistor Q2, mixing diode D1, and associated parts. Transistor Q2 is connected in a typical Hartley oscillator circuit. Feedback is provided from the tap located at the L5-L6 junction. The oscillator frequency is controlled by one section of the three-section variable TUNING capacitor C1. The oscillator output and VHF input signal are mixed in D1 to provide a 40 MHz IF signal. This IF signal is fed to a balancing circuit consisting of potentiometer R6 and fixed capacitor C15.

UHF signals from J1 are fed to the UHF headend. This section employs Q1 and associated parts in a modified-colpitts oscillator circuit. In this circuit part of the capacitive feedback is provided by the inter-element capacity of oscillator transistor Q1. The desired RF input signal is pre-selected by the inductive tuned circuits and mixed in D5 to form a 40 MHz IF signal. The 40 MHz IF output of the UHF mixing circuit is also fed to the balancing circuit. The balancing circuit is set at the factory to equalize outputs from the UHF and VHF headends to provide the same sensitivity calibration on UHF as VHF.

Depending on the position of the VHF-UHF selector switch, either the UHF headend or the VHF headend is connected through the switch contacts to tuned IF transformer T1. Switch S1 also controls the application of power to the selected headend. The output of T1 is fed through a three-stage IF amplifier consisting of Q3, Q4, and Q5 to detector D2. The 20dB attenuator (IF ATTEN), which is connected in the emitter circuit of Q3 permits making the comparative level checks and fine attenuation adjustments. This control also de-sensitizes the FSM-2 to maintain accuracy in strong RF fields.

With the VOLT-AVG-PEAK switch at AVG, the detected video signal is amplified by DC amplifiers Q6 and Q7. The amplified output is applied to meter M1 and to the MOD OUT jack. A minimum of 50 $\mu\text{A}$  is available at full scale

deflection at this jack. This current is sufficient to drive a recorder\* or external meter. With the switch at PEAK, the detected video signal is peak detected, amplified, and then applied to the meter.

Diodes D3 and D4 are used to compensate the DC amplifier for variations in temperature. Zener diode D8 protects the FSM-2 from the accidental application of voltage to the MOD OUT jack J2.

The FSM-2 may be powered from either a 100-130 volt, 50-400 Hz source or two 9-volt series-connected batteries. A switch (OFF-BAT-AC) mounted on the front panel is used to select either a-c or battery power.

With the FSM-2 connected to an a-c power source and the OFF-BAT-AC switch set at AC, current is fed through transformer T5 to rectifier diode D7. The output of D7 is connected through the switch contacts and interlock S8 to a d-c regulator. The interlock disconnects input or battery power from the regulator when the cover is closed. When the OFF-BAT-AC switch is set at BAT, battery power is fed directly through the switch contacts and the interlock to the d-c regulator.

The d-c regulator consists of Q8, Q9, D6 and associated parts. It provides a 12-volt output which is used to power the transistor circuits. Because of the 6-volt difference between the regulator input and output, regulator adjustment is not normally necessary when operating on AC or until the battery voltage drops from the nominal 18 to approximately 13.5 volts.

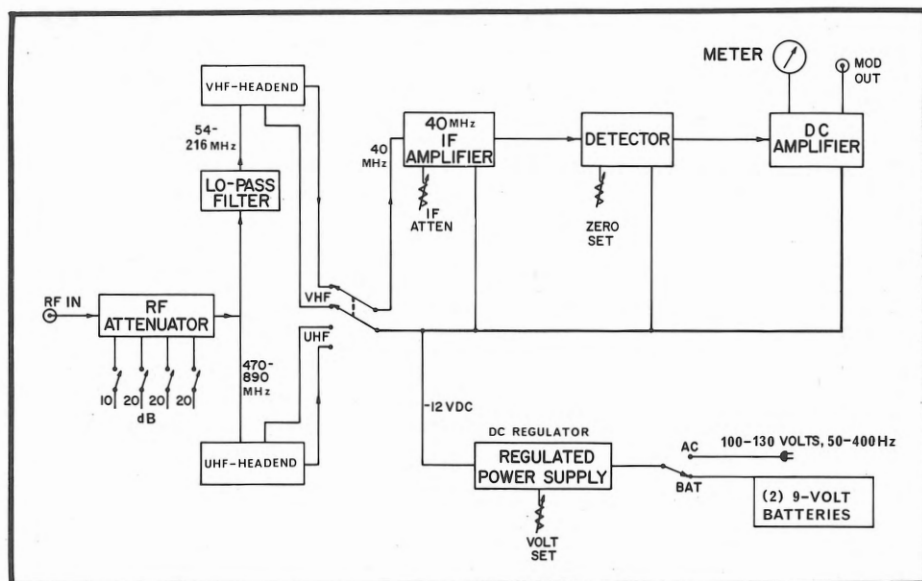


Figure 9. FSM-2 Simplified Block Diagram

\* For information on recording signal strengths, contact the B-T Applications Engineering Department.

## SECTION 6

### SERVICE

#### 6.1 INTRODUCTION

The FSM-2 has been factory aligned and except for unusual circumstances, should not be realigned in the field. If the unit does not perform satisfactorily, return it with a description of the symptoms to:

Service Department  
Blonder-Tongue Laboratories, Inc.  
9 Alling Street, Newark 2, New Jersey 07102

The instrument calibration facility of many industrial users of the FSM-2 may wish to standardize, and/or completely align the field strength meter. Complete alignment requires the use of special jigs and fixtures as well as accurate UHF and VHF signal generators. If the proper equipment and personnel are available, the alignment procedure in this section may be used for this purpose.

In normal use, periodic replacement of the 9-volt batteries is the only service that is required. Replace the batteries if the meter pointer cannot be set to the VOLT SET line when the OFF-BAT-AC switch is at BAT and the VOLT SET knob is turned completely clockwise. (Maximum current drain is 22ma. The power supply regulator will operate until the total battery voltage drops to about 13.5 volts).

If the unit is used with AC line power only, remove the batteries to prevent possible damage from battery leakage.

#### 6.2 GENERAL MAINTENANCE PROCEDURES

Technicians well versed in vacuum-tube circuitry have a sound basis for servicing solid-state circuits, since the basic principles of design and operation of both circuit types are similar.

However, remember that transistors and other solid-state devices may be destroyed almost instantly when handled carelessly, since they cannot bear overloads for extended time periods. This means that many procedures used to check vacuum tube circuits cannot be used for testing and repair of semiconductor circuits.

Do not try to locate defective stages by shorting the stage outputs to ground, since this may cause excessive collector current flow, and severely damage or destroy the device.

Do not try to locate the defective stages by disconnecting the emitter or base biasing circuits. This procedure may result in the application of a voltage which exceeds one of the junctions reverse ratings, thus destroying the transistor.

Do not solder while the unit is in operation.

Transistors, diodes, and their associated parts are heat-sensitive devices. Therefore, when soldering, always use small soldering irons (no more than a 40-watt element, with a 1/8-inch tip diameter). Soldering guns are not recommended. Because of their high available heat, always check soldering irons for leakage to the line, to prevent damage to the circuit under repair. When soldering a transistor, hold the leads with a pair of long-nose pliers between the solder joint and the transistor. The pliers form a heat sink and prevent heat damage. Do not remove the pliers until heat from the solder joint is dissipated.

Transistors and signal-carrying diodes are low-voltage devices. When voltages which exceed device ratings are applied, instant damage or destruction will result. Therefore, never use an ohmmeter to test transistors, since ohmmeter battery supply voltage may exceed junction ratings. For the same reason, always ground soldering iron tips to the chassis under repair.

In direct-coupled transistor circuits (e.g., Q6 and Q7), if one transistor blows, it may take others in the chain with it. Remember this when making replacements.

Solid-state circuits make liberal use of electrolytic capacitors. Since electrolytics are polarized devices, they may be destroyed by inverted polarity. Carefully observe polarity when making replacements.

Part location, lead length, and lead dress are critical at high RF frequencies. Therefore, do not disturb parts during alignment or testing of the unit.

Before making an adjustment or test requiring operation, adjust the VOLT SET control until the meter pointer is at the VOLT SET line (i.e., to adjust B- to -12 volts).

### 6.3 SENSITIVITY CALIBRATION

Standardization of the FSM sensitivity calibration against an accurate RF signal generator can be easily accomplished. On the back of the FSM-2 is a hole plugged with an insert. When this plug is removed, the sensitivity calibration control can be reached with a screwdriver.

Connect the VHF or UHF signal to the input jack with the controls set as follows:

|                       |         |
|-----------------------|---------|
| IF ATTEN:             | 20db    |
| RF ATTENUATORS:       | all OUT |
| VOLT-AVG-PEAK SWITCH: | PEAK    |

Adjust the input signal level to 1mv (1,000  $\mu$ v) voltage if known; (e.g., if the correction chart reads +1db at the frequency in question, this means that the meter reads low at that frequency and 1 + .122 (1mv + 1db) must therefore be applied to the input). See the Calibration Chart on the last page of this manual for the proper correction voltage. Correction charts are used on FSM-2C, and special orders only. Now adjust the sensitivity calibration control for full scale deflection.

### 6.4 CASE REMOVAL

Disconnect all leads and place the unit on several sheets of newspaper or other padding. Proceed as follows:

1. Place the line cord inside the battery compartment, to prevent fouling. Disconnect batteries if used.
2. Remove the cover (see COVER REMOVAL). Remove 5 phillips-head screws from the front panel. (Three are located along the top edge, and one on each side edge).
3. Place the FSM-2 face down on the padding. Remove 11 screws (including those securing the feet) from the bottom of the FSM.
4. Gently lift the cover up, pulling it clear of the chassis.

### 6.5 TROUBLESHOOTING

Table 2 is a troubleshooting chart for the FSM-2. It is to be used as a guide and not an absolute indicator of all possible troubles. For correcting troubles beyond the scope of field maintenance, return the unit to the factory for service.

| SYMPTOM                                                                                                                            | CAUSE                                                                          | REMEDY                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| use of VOLT SET control will not bring meter needle to VOLT SET line, or unstable meter reading during voltage adjusting in set-up | low battery voltage<br>low or poorly regulated line voltage<br>B- line shorted | replace batteries<br>use step-up transformer or switch to battery operation<br>check B- line, which should have a minimum resistance to ground of 1200 ohms; check power supply voltages and components, replacing if necessary                  |
| meter cannot be mechanically zeroed                                                                                                | defective meter                                                                | replace meter                                                                                                                                                                                                                                    |
| meter cannot be brought to electrical zero                                                                                         | VOLT SET control misadjusted<br>DC amplifier malfunction                       | adjust control, as described under Preparation for use<br>check resistances and voltages in DC amplifier section; check VOLT-AVG-PEAK switch; replace parts if necessary                                                                         |
| improper operation in both UHF and VHF modes                                                                                       | UHF-VHF switch defective<br>attenuator malfunction<br>IF malfunction           | replace switch<br>check switches and resistor values; if replacement is necessary, remember that lead dress is critical<br>check resistances and voltages in IF strip; if these are within tolerance, realign IF strip as described in Alignment |
| improper operation in UHF mode only                                                                                                | UHF-VHF switch defective<br>UHF headend malfunction                            | replace switch<br>check voltages and resistances - send unit to factory if realignment or major replacement is indicated                                                                                                                         |
| improper operation in VHF mode only                                                                                                | UHF-VHF switch defective<br>VHF head-end malfunction                           | replace switch<br>check voltages and resistances - send unit to factory if realignment or major replacement is indicated                                                                                                                         |

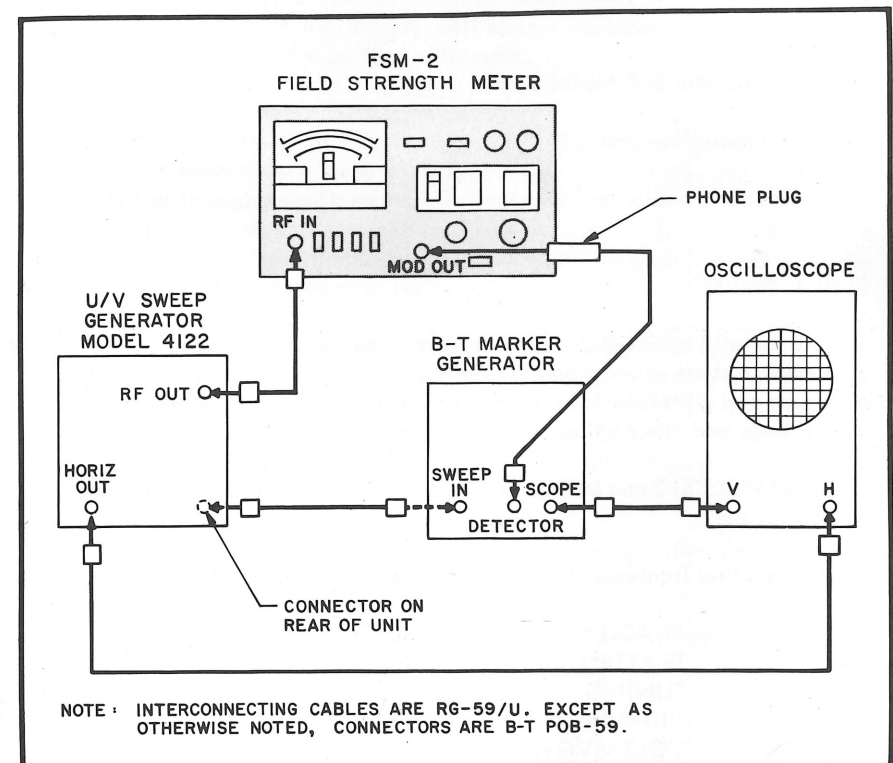
Table 2. Troubleshooting Chart

## 6.6 ALIGNMENT

The following is an abbreviated procedure for field alignment and testing of the Field Strength Meter, and is applicable only where minor adjustment or replacement is required because of aging, vibration, or component failure. All alignment, except the sensitivity calibration, is carried out with the FSM chassis removed from the cabinet.

### Caution

Complete alignment of the FSM-2 should not be attempted in the field since this procedure requires use of special equipment and techniques. No attempt should be made to touch up alignment of an obviously defective unit. Such a unit should be repaired before alignment, or returned to the factory for service.



## EQUIPMENT REQUIRED

The following equipment is required for alignment:

UHF-VHF Sweep Generator UHF (470-890 MHz) and VHF (30-216 MHz);  
B-T Model 4122 or equivalent.

Laboratory quality RF signal generator, with high stability, extremely accurate calibration and a continuously variable, calibrated output level, covering the 30-225 and 450-900 MHz bands.

### Note

The above equipment must have a 75-ohm output impedance, to match the equipment. If the units have a 50-ohm impedance, matching pads, such as B-T Model 4113 are required.

Marker Generator B-T Model 4133

DC coupled oscilloscope

Interconnecting cables and connectors for connecting equipment to FSM-2.

## IF ALIGNMENT

The bottom of the FSM-2 chassis must be shielded during alignment. A suitable metal bottom cover should be fabricated for this purpose. (See bottom of chassis and parts location diagram for locations of holes required for access to slugs and other adjustments).

1. Adjust VOLT SET and METER ZERO controls as described under Preparation for use.

2. Set the other front-panel controls and switches as follows:

|                |           |
|----------------|-----------|
| RF ATTENUATORS | all OUT   |
| IF ATTN        | 20db      |
| TUNING         | 500 MHz   |
| UHF-VHF        | UHF       |
| VOLT-AVG-PEAK  | AVG       |
| OFF-BAT-AC     | BAT or AC |

3. Connect test equipment and FSM-2 as shown in Figure 10.

4. Adjust sweep generator output to exactly 40 MHz.

5. Adjust the output level of the sweep generator and the sensitivity of the oscilloscope for a trace of convenient size. Approximate signal output should be 50 $\mu$ v; approximate scope sensitivity should be 0.5/cm.

### Note

If a large sweep width is used, several responses may be observed on the scope screen. Rock the TUNING control back and forth. Part of the display will remain stationary; this is the portion of interest.

6. Increase the level of the 40 MHz signal from the RF generator until a marker appears on or near the curve. Turn slug of C50 fully clockwise.

7. Using an insulated alignment tool, adjust the cores of T4, T3, T2 and T1 (T1 has two cores) to obtain a symmetrically-rounded curve with the 40mc marker centered atop it.

8. Repeat the sequence in step 6 several times, for optimum shape and symmetry of the curve. If the top of the curve begins to clip (flatten), reduce the amplitude of the input signal.

9. After optimum shape has been obtained, turn brass slug of C50 counter-clockwise until the trace decreases to minimum amplitude.

10. Move the UHF-VHF switch to VHF, and adjust C12 for minimum trace amplitude.

11. Alternate steps 9 and 10 until trace can be reduced no further (the curve may become double-peaked at minimum value.)



## VHF HEADEND

No major alignment of this section should be attempted in the field. Touch-up may be accomplished as follows:

1. Connect test equipment and FSM-2 as shown in Figure 10. Set operating controls as listed under IF alignment.
2. Turn TUNING control to 220 MHz. Move the UHF-VHF switch to VHF.
3. Inject a 50 $\mu$ v sweep signal into the RF IN jack, center about 220 MHz, using the marker generator to establish correct frequency setting.
4. Adjust C2, C4 and C7 very slightly for maximum trace symmetry.

## UHF HEADEND

As above, only the touch-up described should be performed in the field.

1. Connect the test equipment and FSM-2 as shown in Figure 10. Set operating controls as listed under IF Alignment.
2. Turn the TUNING control to 480 MHz.
3. Inject a 50 $\mu$ v sweep signal into the RF IN jack. Center the signal at 480 MHz, using the marker generator to establish the correct frequency setting.
4. Adjust C55 and C62 slightly for maximum trace symmetry.

## VHF-UHF BALANCE

Accurately-calibrated signal generators are a necessity for this adjustment, since a gain recalibration must follow any balance adjustment.

1. Set the FSM controls and switches as follows:

|                |                   |
|----------------|-------------------|
| RF ATTENUATORS | all OUT           |
| IF ATTEN       | 20db              |
| VOLT-AVG-PEAK  | PEAK              |
| UHF-VHF        | UHF               |
| TUNING         | 620 MHz (approx.) |
| OFF-BAT-AC     | BAT or AC         |

2. Adjust R6 (mounted on the rear of the UHF-VHF Switch) to approximately mid-range.
3. Apply a 0.5mv 620 MHz signal to the RF IN jack of the FSM. Tune for maximum meter reading.
4. Adjust R22 (on rear chassis apron) for a meter reading of 0.5 mv.
5. Move the UHF-VHF switch to VHF, and apply a signal of 0.5mv at 90 MHz to the RF IN jack. Tune for maximum meter reading.
6. Note the meter indication. If the meter indicates more or less than it did in step 4, adjust R6 until the meter readings at both frequencies are identical.

## GAIN-SENSITIVITY CALIBRATION

Remove the chassis from the case to perform this procedure. Set the controls and switches of the FSM-2 as follows:

|                |                            |
|----------------|----------------------------|
| RF ATTENUATORS | 10db switch IN; others OUT |
| IF ATTEN       | 20db                       |
| VOLT-AVG-PEAK  | PEAK                       |
| UHF-VHF        | VHF                        |
| TUNING         | 95 MHz (approx.)           |
| OFF-BAT-AC     | BAT or AC                  |

1. Apply a 95 MHz unmodulated signal at an accurate calibrated level of 1 mv to the RF input. Tune for maximum meter reading.
2. Adjust R22 (on rear apron) for reading of 1 mv on the 0-3 scale.
3. Switch the 10db RF ATTENUATOR OUT, and touch up R22 for a 1mv reading on the 0-1 scale.

## PARTS LOCATION AND SCHEMATIC DIAGRAM

Parts location diagrams for the unit are shown in Figures 11-13. A schematic diagram and parts list is supplied as a separate slip-in sheet to this manual.

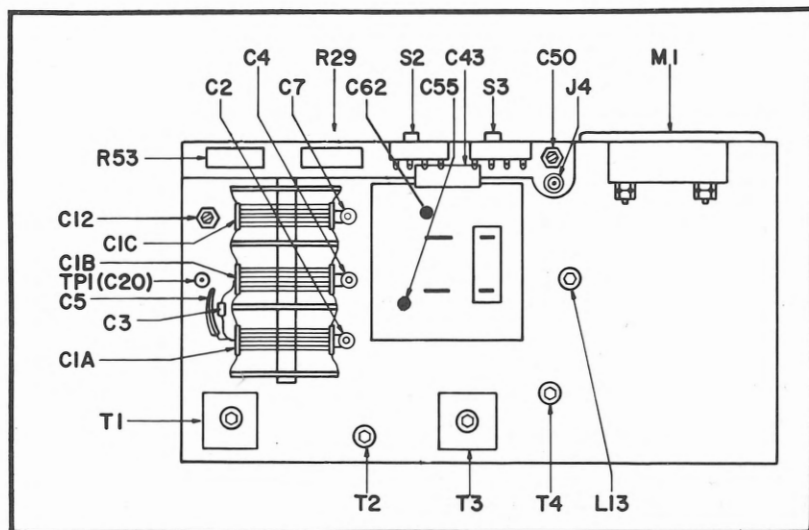


Figure 11. Parts Location Top Interior View

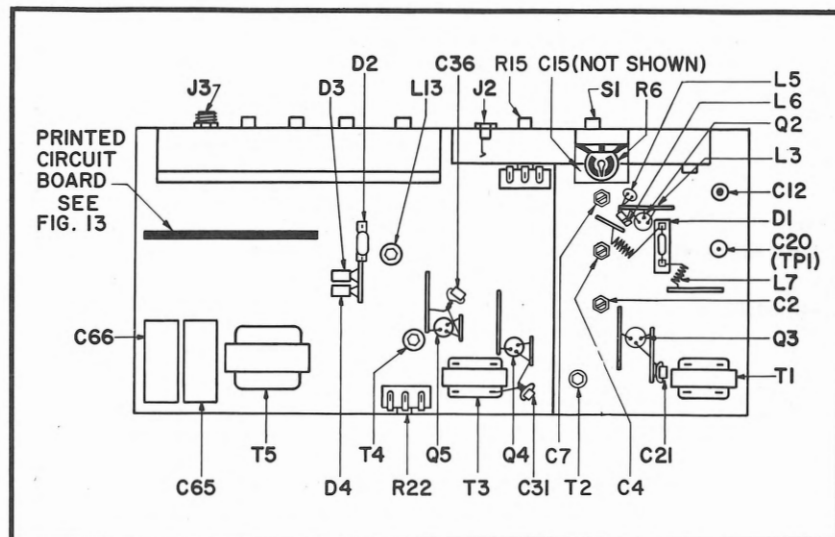


Figure 12. Parts Location Bottom Interior View

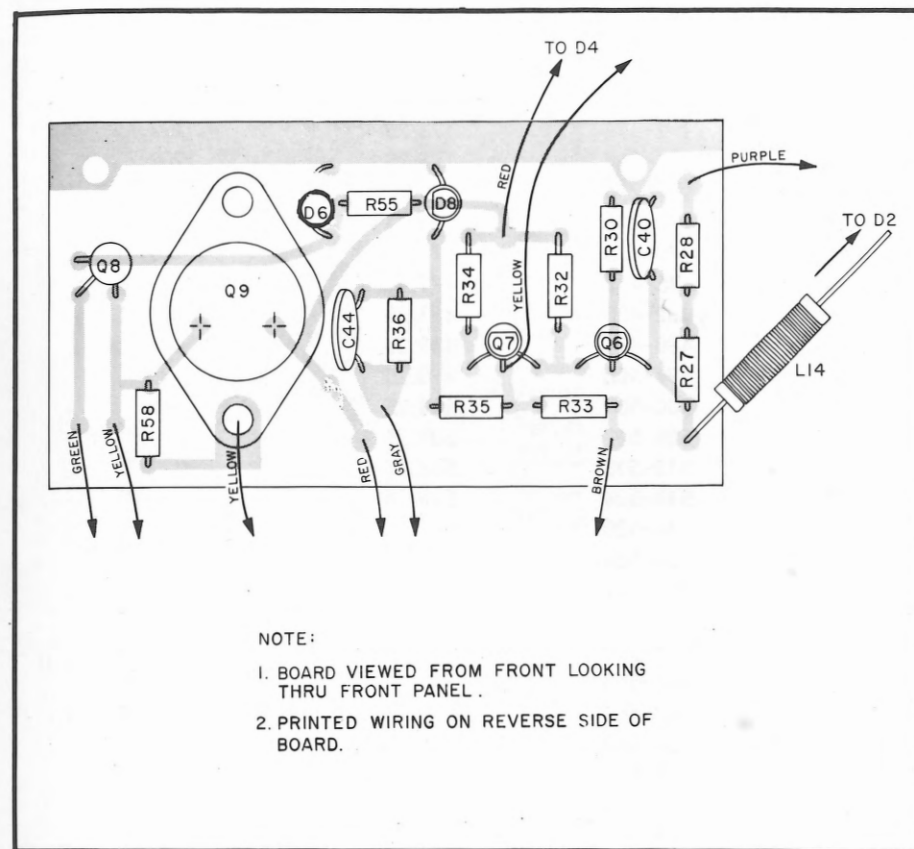


Figure 13. Parts Location Printed Circuit Board

## U. S. TELEVISION CHANNEL FREQUENCIES

| CHANNEL | BAND    | VIDEO CARRIER | SOUND CARRIER |
|---------|---------|---------------|---------------|
| 2       | 54-60   | 55.25         | 59.75         |
| 3       | 60-66   | 61.25         | 65.75         |
| 4       | 66-72   | 67.25         | 71.75         |
| 5       | 76-82   | 77.25         | 81.75         |
| 6       | 82-88   | 83.25         | 87.75         |
| 7       | 174-180 | 175.25        | 179.75        |
| 8       | 180-186 | 181.25        | 185.75        |
| 9       | 186-192 | 187.25        | 191.75        |
| 10      | 192-198 | 193.25        | 197.75        |
| 11      | 198-204 | 199.25        | 203.75        |
| 12      | 204-210 | 205.25        | 209.75        |
| 13      | 210-216 | 211.25        | 215.75        |
| 14      | 470-476 | 471.25        | 475.75        |
| 15      | 476-482 | 477.25        | 481.75        |
| 16      | 482-488 | 483.25        | 487.75        |
| 17      | 488-494 | 489.25        | 493.75        |
| 18      | 494-500 | 495.25        | 499.75        |
| 19      | 500-506 | 501.25        | 505.75        |
| 20      | 506-512 | 507.25        | 511.75        |
| 21      | 512-518 | 513.25        | 517.75        |
| 22      | 518-524 | 519.25        | 523.75        |
| 23      | 524-530 | 525.25        | 529.75        |
| 24      | 530-536 | 531.25        | 535.75        |
| 25      | 536-542 | 537.25        | 541.75        |
| 26      | 542-548 | 543.25        | 547.75        |
| 27      | 548-554 | 549.25        | 553.75        |
| 28      | 554-560 | 555.25        | 559.75        |
| 29      | 560-566 | 561.25        | 565.75        |
| 30      | 566-572 | 567.25        | 571.75        |
| 31      | 572-578 | 573.25        | 577.75        |
| 32      | 578-584 | 579.25        | 583.75        |
| 33      | 584-590 | 585.25        | 589.75        |
| 34      | 590-596 | 591.25        | 595.75        |
| 35      | 596-602 | 597.25        | 601.75        |
| 36      | 602-608 | 603.25        | 607.75        |
| 37      | 608-614 | 609.25        | 613.75        |
| 38      | 614-620 | 615.25        | 619.75        |
| 39      | 620-626 | 621.25        | 625.75        |
| 40      | 626-632 | 627.25        | 631.75        |
| 41      | 632-638 | 633.25        | 637.75        |
| 42      | 638-644 | 639.25        | 643.75        |
| 43      | 644-650 | 645.25        | 649.75        |

## U. S. TELEVISION CHANNEL FREQUENCIES (Continued)

| CHANNEL | BAND    | VIDEO CARRIER | SOUND CARRIER |
|---------|---------|---------------|---------------|
| 44      | 650-656 | 651.25        | 655.75        |
| 45      | 656-662 | 657.25        | 661.75        |
| 46      | 662-668 | 663.25        | 667.75        |
| 47      | 668-674 | 669.25        | 673.75        |
| 48      | 674-680 | 675.25        | 679.75        |
| 49      | 680-686 | 681.25        | 685.75        |
| 50      | 686-692 | 687.25        | 691.75        |
| 51      | 692-698 | 693.25        | 697.75        |
| 52      | 698-704 | 699.25        | 703.75        |
| 53      | 704-710 | 705.25        | 709.75        |
| 54      | 710-716 | 711.25        | 715.75        |
| 55      | 716-722 | 717.25        | 721.75        |
| 56      | 722-728 | 723.25        | 727.75        |
| 57      | 728-734 | 729.25        | 733.75        |
| 58      | 734-740 | 735.25        | 739.75        |
| 59      | 740-746 | 741.25        | 745.75        |
| 60      | 746-752 | 747.25        | 751.75        |
| 61      | 752-758 | 753.25        | 757.75        |
| 62      | 758-764 | 759.25        | 763.75        |
| 63      | 764-770 | 765.25        | 769.75        |
| 64      | 770-776 | 771.25        | 775.75        |
| 65      | 776-782 | 777.25        | 781.75        |
| 66      | 782-788 | 783.25        | 787.75        |
| 67      | 788-794 | 789.25        | 793.75        |
| 68      | 794-800 | 795.25        | 799.75        |
| 69      | 800-806 | 801.25        | 805.75        |
| 70      | 806-812 | 807.25        | 811.75        |
| 71      | 812-818 | 813.25        | 817.75        |
| 72      | 818-824 | 819.25        | 823.75        |
| 73      | 824-830 | 825.25        | 829.75        |
| 74      | 830-836 | 831.25        | 835.75        |
| 75      | 836-842 | 837.25        | 841.75        |
| 76      | 842-848 | 843.25        | 847.75        |
| 77      | 848-854 | 849.25        | 853.75        |
| 78      | 854-860 | 855.25        | 859.75        |
| 79      | 860-866 | 861.25        | 865.75        |
| 80      | 866-872 | 867.25        | 871.75        |
| 81      | 872-878 | 873.25        | 877.75        |
| 82      | 878-884 | 879.25        | 883.75        |
| 83      | 884-890 | 885.25        | 889.75        |

# DBMV-MICROVOLT EQUIVALENTS

| dbmv | uv    | dbmv | uv      | dbmv | uv       |
|------|-------|------|---------|------|----------|
| -40  | 10    | 0    | 1,000   | 40   | 100,000  |
| -39  | 11    | 1    | 1,100   | 41   | 110,000  |
| -38  | 13    | 2    | 1,300   | 42   | 130,000  |
| -37  | 14    | 3    | 1,400   | 43   | 140,000  |
| -36  | 16    | 4    | 1,600   | 44   | 160,000  |
| -35  | 18    | 5    | 1,800   | 45   | 180,000  |
| -34  | 20    | 6    | 2,000   | 46   | 200,000  |
| -33  | 22    | 7    | 2,200   | 47   | 220,000  |
| -32  | 25    | 8    | 2,500   | 48   | 250,000  |
| -31  | 28    | 9    | 2,800   | 49   | 280,000  |
| -30  | 32    | 10   | 3,200   | 50   | 320,000  |
| -29  | 36    | 11   | 3,600   | 51   | 360,000  |
| -28  | 40    | 12   | 4,000   | 52   | 400,000  |
| -27  | 45    | 13   | 4,500   | 53   | 450,000  |
| -26  | 50    | 14   | 5,000   | 54   | 500,000  |
| -25  | 56    | 15   | 5,600   | 55   | 560,000  |
| -24  | 63    | 16   | 6,300   | 56   | 630,000  |
| -23  | 70    | 17   | 7,000   | 57   | 700,000  |
| -22  | 80    | 18   | 8,000   | 58   | 800,000  |
| -21  | 90    | 19   | 9,000   | 59   | 900,000  |
| -20  | 100   | 20   | 10,000  | 60   | 1.0 volt |
| -19  | 110   | 21   | 11,000  | 61   | 1.1      |
| -18  | 130   | 22   | 13,000  | 62   | 1.3      |
| -17  | 140   | 23   | 14,000  | 63   | 1.4      |
| -16  | 160   | 24   | 16,000  | 64   | 1.6      |
| -15  | 180   | 25   | 18,000  | 65   | 1.8      |
| -14  | 200   | 26   | 20,000  | 66   | 2.0      |
| -13  | 220   | 27   | 22,000  | 67   | 2.2      |
| -12  | 250   | 28   | 25,000  | 68   | 2.5      |
| -11  | 280   | 29   | 28,000  | 69   | 2.8      |
| -10  | 320   | 30   | 32,000  | 70   | 3.2      |
| -9   | 360   | 31   | 36,000  | 71   | 3.6      |
| -8   | 400   | 32   | 40,000  | 72   | 4.0      |
| -7   | 450   | 33   | 45,000  | 73   | 4.5      |
| -6   | 500   | 34   | 50,000  | 74   | 5.0      |
| -5   | 560   | 35   | 56,000  | 75   | 5.6      |
| -4   | 630   | 36   | 63,000  | 76   | 6.3      |
| -3   | 700   | 37   | 70,000  | 77   | 7.0      |
| -2   | 800   | 38   | 80,000  | 78   | 8.0      |
| -1   | 900   | 39   | 90,000  | 79   | 9.0      |
| -0   | 1,000 | 40   | 100,000 | 80   | 10.0     |

DEFINITION OF dbmv

Odbmv = 1,000 uv across 75 ohms

## FSM-2 CALIBRATION CHART

Serial No. 131C 133256

| VHF             |                    | UHF             |                    |
|-----------------|--------------------|-----------------|--------------------|
| Frequency (MHz) | Corr. Factor (dB)* | Frequency (MHz) | Corr. Factor (dB)* |
| 55              | .....              | 470             | .....              |
| 60              | .....              | 480             | .....              |
| 65              | .....              | 500             | .....              |
| 70              | .....              | 520             | .....              |
| 75              | .....              | 540             | .....              |
| 80              | .....              | 560             | .....              |
| 85              | .....              | 580             | .....              |
| 90              | .....              | 600             | .....              |
| 95              | .....              | 620             | .....              |
| 110             | .....              | 640             | .....              |
| 130             | .....              | 660             | .....              |
| 150             | .....              | 680             | .....              |
| 170             | .....              | 700             | .....              |
| 180             | .....              | 740             | .....              |
| 190             | .....              | 780             | .....              |
| 200             | .....              | 820             | .....              |
| 210             | .....              | 860             | .....              |
| 220             | .....              | 890             | .....              |

\*Correction factor is added or subtracted algebraically (as indicated by sign) to the meter reading.



**BLONDER-TONGUE**



**BLONDER - TONGUE**  
LABORATORIES, INC., NEWARK, N. J. 07102

DIAL CORD REPLACEMENT  
INSTRUCTIONS  
FOR B-T FIELD STRENGTH METER  
MODEL FSM-2

RECOMMENDED DIAL CORD:

1. Ashway Products # 270-01 or
2. General Cement # 75-25 or
3. Walsco # 656-02

NECESSARY TOOLS:

1. 5/64 Allen Wrench
2. 1/4" Nut Driver
3. Phillips Screw Driver

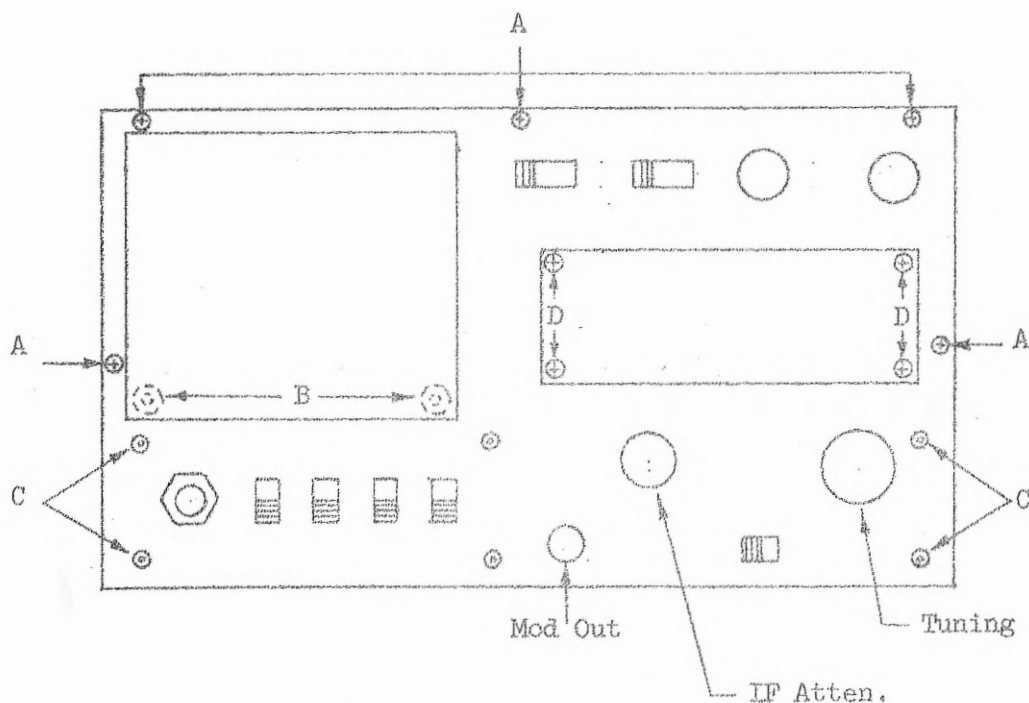


FIG. 1



### 1. CHASSIS REMOVAL INSTRUCTIONS:

- a) Remove three rubber mounting feet and four Phillips head screws from bottom of case.
- b) Remove five Phillips head screws from face of unit, (marked "A" fig 1).
- c) Disconnect and remove two batteries from rear compartment of case.
- d) Rotate dial to 52.5 MHz, this will close the capacitor sections.
- e) Remove chassis from case.

### 2. FRONT PANEL REMOVAL INSTRUCTIONS:

- a) Remove two nuts and washers from rear of lower meter mounting screws, (marked "B" fig. 1).
- b) Remove four Allen head screws from face of panel, (marked "C" fig. 1 ).
- c) Remove the tuning knob, IF attenuation knob and the hold down nut on the "mod-out" jack.
- d) Swing front panel, still attached to chassis by cable harness and coaxial, up and out of the way.
- e) Remove dial plate grounding spring.
- f) Remove center screw from dial plate and remove dial plate with pulley from shaft.

### 3. UHF TUNER AND CAPACITOR PULLEY DIAL CORD:

- a) Length of dial cord should be  $32 \frac{3}{4}$ " as illustrated (under moderate tension).



- b) Capacitor pulley and UHF tuner pulley to be rotated fully clockwise before attempting to string dial cord.

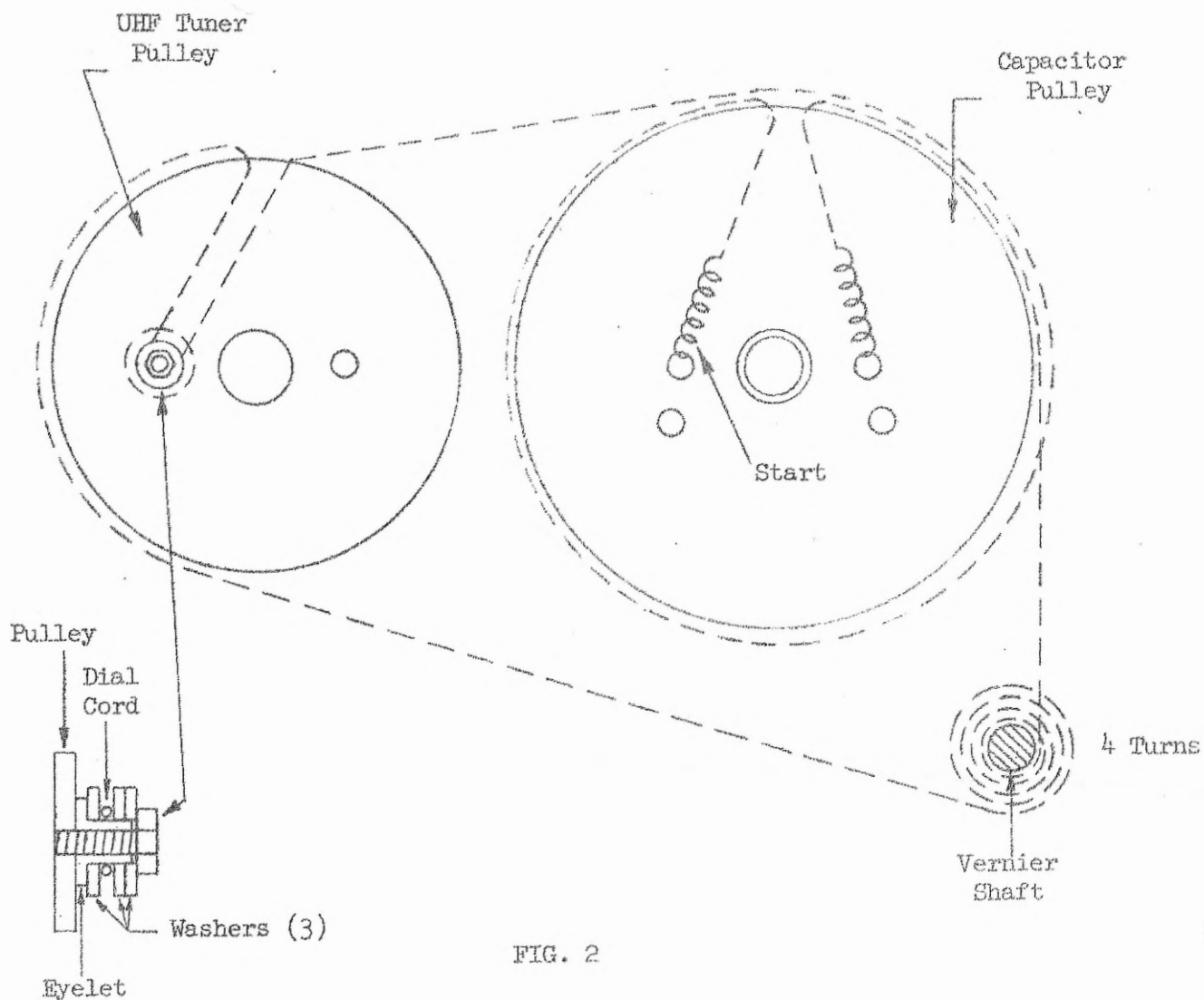
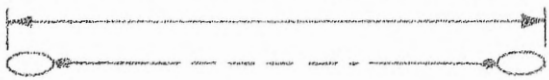


FIG. 2

#### 4. UHF TUNER AND DIAL PLATE PULLEY

- a) Dial cord length should be  $23 \frac{7}{8}$ " long as illustrated, (under moderate tension).  (Loops are drawn to size.)
- b) UHF tuner to be rotated fully clockwise and dial plate pulley to be positioned as shown.

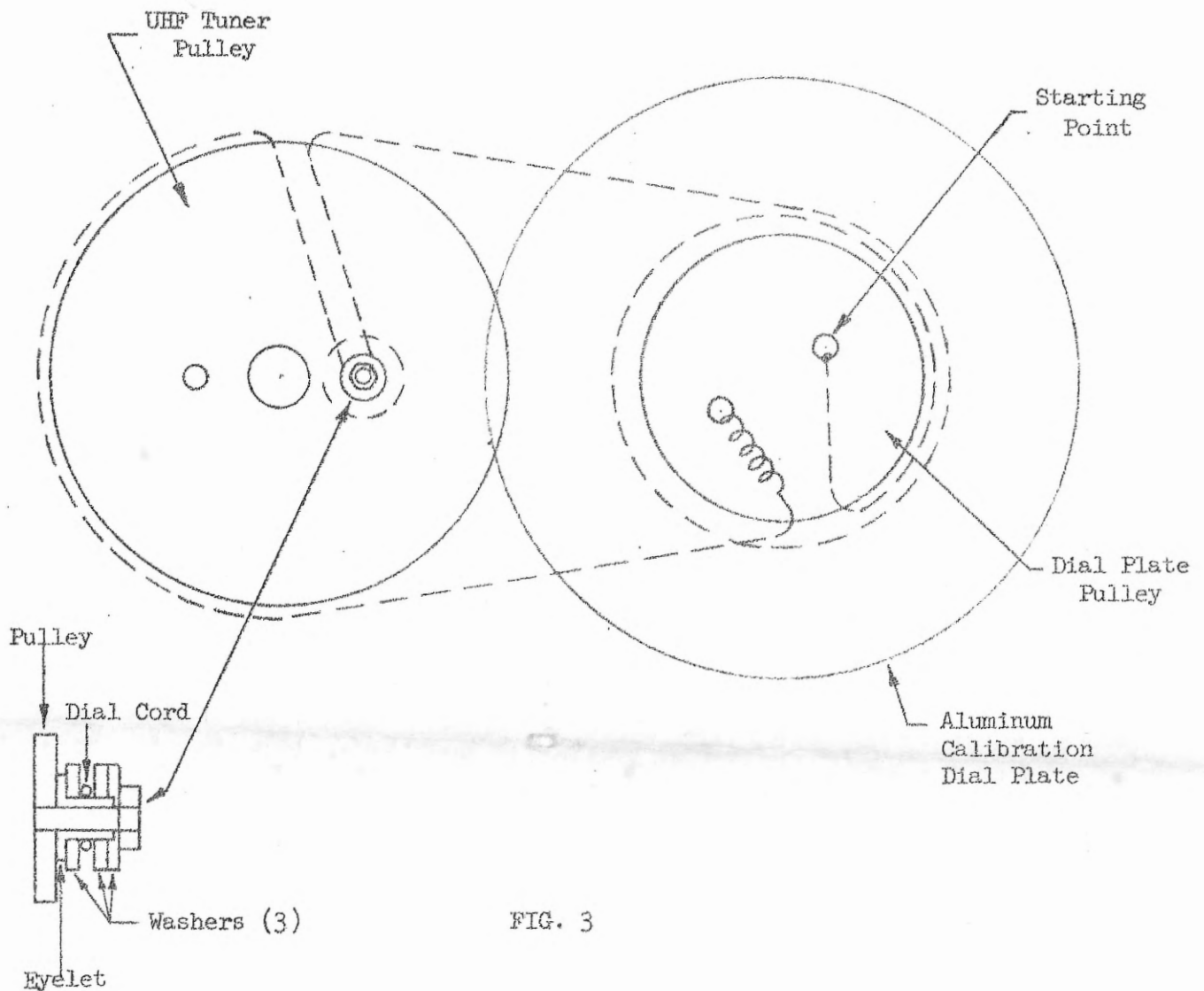


FIG. 3

##### 5. CALIBRATION DIAL ADJUSTMENT:

- a) Remount front panel to chassis, use previous instructions in reverse.
- b) Remove plastic escutcheon (window) from panel, (marked "D" fig. 1).
- c) Calibration dial should be positioned as shown in figure 4.  
Capacitor and UHF pulleys to be rotated fully in a counter clockwise direction.



# BLONDER-TONGUE LABS NEWARK, NEW JERSEY

## FSM-2 SIMPLIFIED OPERATING PROCEDURE AND CONTROL FUNCTIONS

### OPERATING PROCEDURE

1. Set OFF-BAT-AC Switch OFF.
2. Either install batteries or plug unit into a 117V, 60-cps voltage source.
3. Adjust meter mechanical zero adjustment until meter pointer is at METER ZERO line.
4. Set OFF-BAT-AC switch to either BAT or AC depending on type of power used. Set VOLT-AVG-PEAK switch to VOLT.
5. Adjust VOLT SET control until meter pointer is at VOLT SET line.
6. Set VOLT-AVG-PEAK switch to either AVG or PEAK. Adjust ZERO SET control until meter pointer is at ELECT ZERO line.
7. Set VHF-UHF switch to desired band.
8. Connect input signal to RF IN jack.
9. Tune desired signal with TUNING knob. Insert attenuation as required for meter reading in top 2/3 of scale.
10. Read signal level using scales on meter face. When calculating attenuation, always add reading of IF ATTEN to value of fixed attenuators.

### NOTE

For detailed operating procedures and typical applications, refer to the instruction manual.

### CONTROL FUNCTIONS

| CONTROL                                          | FUNCTION                                                                                                                                                                                                                                                                      |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OFF-BAT-AC<br>VOLT-AVG-PEAK                      | On-off and power selector switch. VOLT position—monitors internal operating voltage.<br><br>AVG position—meter shows average value of RF IN signal. Detected r-f signal is internally connected to MOD OUT jack.<br><br>PEAK position—meter shows peak value of RF IN signal. |
| ZERO SET                                         | Electrical zero set                                                                                                                                                                                                                                                           |
| VOLT SET                                         | Adjusts internal operating voltage.                                                                                                                                                                                                                                           |
| IF ATTEN                                         | Variable attenuator. Controls meter sensitivity.                                                                                                                                                                                                                              |
| VHF-UHF                                          | Selects operating band.                                                                                                                                                                                                                                                       |
| TUNING                                           | Selects operating frequency of FSM-2.                                                                                                                                                                                                                                         |
| Fixed<br>Attenuators<br>10db, 20db (3)           | Control attenuation of RF IN signal. Values from 10 to 70db (in 10db steps) are available.                                                                                                                                                                                    |
| Mechanical<br>Zero Adjustment<br>(on meter face) | Mechanically zeros meter movement.                                                                                                                                                                                                                                            |

|    |                                              |                              |                             |
|----|----------------------------------------------|------------------------------|-----------------------------|
| 1. | Was this item securely packaged as received? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. | Are the instructions clear?                  | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. | Does this item perform to your expectations? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. | Does the appearance meet your standards?     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Street

City

State

Date of Purchase

Dealer's Name \_\_\_\_\_

# Model

Serial #

(Card must be returned within 10 days of purchase date or warranty is void)

**FILL THIS CARD OUT AND MAIL IMMEDIATELY**

Each Blonder-Tongue Product is produced under rigid quality control standards. This unit is fully warranted to be free from defects in workmanship and components for a period of 120 days from date of purchase. If service is required during this warrantee period please pack the unit carefully and send it prepaid to:

9 ALLING ST., NEWARK, N. J. 07102

Enclose a packing slip indicating:

1. Your name and address
2. Model and serial number of equipment
3. Description of defect

This unit will be repaired and returned to you prepaid.

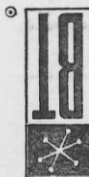
**This warranty does not apply to defects caused by mishandling or misuse of equipment.**

NEWARK, NEW JERSEY 07102

9 ALLING STREET

**BLONDER-TONGUE LABORATORIES, INC.**

PLACE  
STAMP  
HERE



(TEAR HERE)

**THIS IS YOUR WARRANTY**

**Please Retain This Part of the  
Card for Your Records**

*engineered and manufactured by*

**BLONDER**  **TONGUE**

*9 Alling St., Newark, 2 N. J.*